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The estimation of pion and kaon maximal emission times in $5.02A$ TeV collisions at the LHC

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In [1] a simple method allowing one to estimate the times of maximal emission for pions and kaons,created in the LHC Pb+Pb collisions at $\sqrt{s_{NN}} = 2.76$˜TeV, based on the combined fitting of their p_T spectra and the dependences of longitudinal femtoscopy radii on the pair transverse mass, $R_{\rm long}(m_T)$, was proposed and tested within the hydrokinetic model (HKM), able to simulate the process of the matter evolution in course of a relativistic heavy-ion collision. The entire evolution process is described as passing in several stages within the model (the initial state formation, the hydrodynamical expansion of continuous medium, the matter particlization, and the final "afterburner" hadron cascade stage). The proposed method was successfully applied to the analysis of the experimental data by the ALICE Collaboration˜[2].
In the current work the same method is applied to the femtoscopy analysis of Pb+Pb collisions at a higher LHC energy, $\sqrt{s_{NN}} = 5.02$˜TeV, within an improved model version - the integrated hydrokinetic model (iHKM), which, in particular, additionally includes the simulation of the pre-thermal stage of the system's evolution and viscous (instead of previously used ideal) hydrodynamics for the description of (quasi)equilibrated expansion of nearly thermalized quark-gluon matter.
The obtained fitting results for pion and kaon maximal emission times in the three centrality classes are consistent with the corresponding approximate time values, estimated based on the model emission function graphs˜[3]. Thus, the method can be proposed for use in the experimental analysis of A+A collisions at the current LHC energy. The extracted maximal emission time values decrease, when one goes from central to non-central events. The kaons are emitted later than pions, mainly due to the $K^*(892)$ resonance decay contribution to the total kaon yield. The m_T scaling between pions and kaons gets broken because of the strong transverse collective flow at the hydrodynamical stage and the intensive hadron-hadron scatterings at the post-hydrodynamical stage of the collision.

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